Septicemia is a life-threatening bloodstream infection that is a serious public health concern worldwide and is deadly if not treated with appropriate antimicrobial agents. Sepsis refers to the bacterial toxins production or release in bloodstream. Signs of systemic infection and positive blood culture are best characterized the septicemia. In pediatric patients, septicemia is still a major reason of illness and mortality in spite of improvement in antimicrobial regimes and supportive treatment. Different factors such as unexplained fever, major injury, length of hospital stay or previous hospitalization, chronic antimicrobial therapy and invasive procedures considered to be important in increasing the incidence rate of septicemia. According to the recent scientific publications, it is estimated that in 2017, about 48.9 million new septicemia cases were registered altogether, while 11.0 million mortalities...
associated with septicemia were reported, accounting 20% of all mortalities across the world. In 2020, World Health Organization (WHO) estimated that 41% cases of septicemia cases were reported from Asian and Sub-Saharan countries, while most affected age group was under 5 years of age in children accounting for 30-70% cases. In intensive care patients, it accounts for about 42% mortality rate. Additionally, among all hospital-related infections, 15% linked to BSI’s. In pediatric population, blood stream infections due to bacteria and increasing resistance against antimicrobials frequently result in prolonged infections and treatment failure. Diagnosis of septicemia is usually done on the basis of clinical signs and symptoms and laboratory parameters of patients, but for the confirmation of septicemia, positive culture from blood is mandatory. Common symptoms of septicemia in pediatric population includes fever, hypothermia, lethargy, diarrhea and vomiting, abdominal distension, and respiratory distress. Bacterial spectrums causing septicemia are different from place to place. Various Gram positive and Gram-negative bacteria can cause septicemia. Antimicrobial treatment is started through empirical observation earlier than the blood culture results in almost all septicemia cases. Improperly treated septicemia cases may have a 100% death rate. In countries with limited resources, increase in antimicrobial resistance among all types of pathogenic bacteria has gotten worsen. Thus, the present study was designed to assess the frequency of bacterial isolates and their antimicrobial susceptibility pattern amongst septicemia patients in Lahore.

**METHODS**

This retrospective study was conducted in pathology department of Hameed Latif Hospital, Lahore, over a period of two years, from 1st January 2021 to 31 December 2022. Samples from Age group of 0 to 12 years of both genders were included in the study. Repetitive samples from the same patient were excluded. Blood samples (4 mL for children and 10 mL for adults) were collected from every patient before any antibiotic use by experienced staff nurses. Samples were collected from patients who had fever while diagnosis was done. Bact/Alert blood culture bottles were used to collect the blood samples and were transported to the microbiology laboratory. Blood culturing was done through automation in BACT/ALERT 3D culture system (bioMerieux, Durham, NC, USA). After the detection of microbial growth by Bact/Alert 3D system, gram staining was performed from the positive samples. Samples were sub cultured on blood agar, chocolate agar, and MacConkey agar. After sub-culturing, the inoculated culture plates were incubated for 18-24 hours at 37˚C aerobically, after overnight incubation, different microbiological procedures were used to identify bacterial isolates. For identification of Gram-negative bacteria, different biochemical tests like indole test, citrate utilization, urease test, triple sugar iron, lysine decarboxylase test, motility tests and API 20E were used. While for the identification of Gram-positive bacteria, Gram reaction, their pattern of hemolysis, catalase and coagulase tests were used. VITEK 2 Compact Automated ID/AST instrument (bioMerieux) were used for the antimicrobial sensitivity and interpretation was done according to the guidelines of the Clinical & Laboratory Standards Institute guidelines 2022.

**RESULTS**

1306 blood cultures from suspected cases of bacterial sepsis were analyzed over the period of 2 years from 1st January 2021 to 31 December 2022. Among these, 217(16.6%) were positive for bacterial growth. Among positive cases, Gram negative organisms were predominant isolates 181(83.4%), while Gram positive organisms were isolated in 36(16.6%) samples. Among Gram negative, predominant organism was Salmonella typhi 52(28.7%), followed by Acinetobacter baumannii 41(22.6%), Klebsiella pneumoniae 20(), Salmonella paratyphi A and Burkholderia cepacia, 18(9.9%) each. Among Gram positive, predominant bacteria isolate was Methicillin resistant Staphylococcus aureus 13(36.1%), followed by Streptococcus pneumoniae 12(36%). (Figure 1)
Antimicrobial sensitivity testing was performed for both Gram negative and gram-positive organisms. Among Gram negative organisms, maximum resistance (72.9%) was observed against Tetracycline, followed by Fluoroquinolones (62.1%), Cephalosporins (61%), while Carbapenems showed minimum resistance against Gram negative organisms which was 34.9%. (Figure 2)

**Gram positive organisms** showed maximum resistance against Aminopenicillin which was 69.1%, followed by Macrolides (68.6%), Ti-Folate (58.1%), while minimum resistance was observed against Aminoglycosides which was 35.5%.(Figure 3)

**DISCUSSION**

In pediatric population, blood stream infections due to bacteria and increasing resistance against antimicrobials frequently result in prolonged infections and treatment failure. In the present study, prevalence of positive cases among clinical suspected cases of septicemia was found to be 16.6% which was in accordance with various studies conducted by (16.08–22.3%)29 (16.08–22.3%),30 (18.2%)31 and (19.4%).32 However, lower than a study conducted in Iran (38%),33 Cameroon (28.3%) (22). On the other hand, current study showed high prevalence from the studies conducted in Kuwait (2.3%)34 and Nepal (10.6%).35 The possible reason for this variation might be due to epidemiological variations, execution of infection control and prevention, diagnostic system for blood culture identification and health care policies in different countries.

In the current study, Gram-negative bacteria were predominant than Gram-positive bacteria, with the prevalence of 83.4% and 16.6% respectively. Similar results were reported in Iran (55.4%)36 and Nepal (52.3%).37 However, studies conducted in India38 and Gondar39 reported higher prevalence of Gram positive bacteria. This variability may be due to differences in methodology and diagnostic methods.

Among Gram-positive bacteria, most common isolates were found to be S.aureus and Methicillin-resistant Staphylococcus aureus with the percentage of 36% each. Our results were similar with a study conducted in India (40), South Africa,41 Addis Abeba, Ethiopia.42 Resistance pattern of Gram-positive bacteria showed maximum resistance against Aminopenicillin and Macrolides which was 69.1% and 68.6% respectively, which was in accordance with the study conducted in different countries.43-45 The high rate of resistance may be because of inappropriate or misuse
of antibacterial drugs.

Most common Gram-negative organism is our study was found to be S. typhi and A. baumanii which the prevalence of 28.1% and 22.6% respectively, which was in accordance with the study done in India in 2019.46 Gram negative bacteria showed maximum resistance to Tetracyclines (72.9%), Fluoroquinolones (62.1%) and Cephalosporins (61%). Similar results were reported in India which showed 69% resistance against Tetracyclines.46 Our results were also consistent with the studies conducted in Cameroon and Ethiopia, which reported 45-90% resistance to gentamycin, ciprofloxacin, and ceftriaxone.

The limitation of this study was that the samples were collected from a single hospital, and bacterial isolates were only identified phenotypically.

CONCLUSION

Bloodstream infections remains an important health problem in pediatric population. It is vital to analyze the blood culture reports and its antimicrobial sensitivity pattern. Formulation of local antibiotic usage guidelines to improve clinical outcomes is equally important. Gram negative bacteria were more prevalent agents for septicemia in our study population. S. typhi, A. baumanii and S. aureus were the predominant causative agents for septicemia. High resistance rate of organisms against commonly used antibiotics calls for re-evaluation of protocols and policies of antibiotic empirical therapy.

REFERENCES


